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ABSTRACT

Since World War II, women have become a permanent part of the American work force but are under-represented in most scientific professions. Researchers are now aware of gender influences on expectations and achievement in academic settings, with research indicating that females have lower expectations of competence in science-related professions. Gender differences were explored in beginning architecture students (N=200) at the University of Arizona. After completing a semester design project, students were given a survey to assess gender influences and project effectiveness. Females reported significantly less experience in architecture and had significantly lower grade expectations for the project than did males. There were no significant gender differences on actual project grades or final course grades. Although beginning female architecture students lacked experience and had lower expectations for subject success when compared to their male counterparts, their final achievement and performance was consistent with males. These findings suggest that females may have a more accurate perception of performance and achievement while males may have a distorted perception of achievement. (Author/NB)

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Gender and Grade Expectation
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Gender and Grade Expectation in University Students

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Abstract

Since World War II women have become a permanent part of the American work force but are under-represented in most scientific professions. Researchers are now aware of gender influences on expectations and achievements in academic settings, with research indicating that females have lower expectations of competence in science-related professions. Gender differences were explored in beginning architecture students ($N = 200$) at the University of Arizona (1985-86). After completing a semester design project, students were given a survey to assess gender influences and project effectiveness. Females reported significantly less experience in architecture (Chi Square [$2, N = 55$] = 55.48, $p < .05$) and had significantly lower grade expectations for the project (Chi Square [$2, N = 194$] = 10.34). There were no significant gender differences on actual project grades or final course grades. Although beginning female architecture students lack experience and have lower expectations for subject success when compared to their male counterparts, their final achievement and performance is consistent with males. The data suggest that females may have a more accurate perception of performance and achievement while males may have a distorted perception of achievement.

Gender and Grade Expectation in
Architectural Education

Within the field of architecture, there is little formal research into educational methodology. Dinham (1987) surveyed the literature on architectural education and observed that in comparison with other fields, such as teacher education and medical education, architecture has a surprisingly sparse literature related to educational issues.

An area of interest with great potential utility for architectural educators is that of gender research. There is considerable data, however, showing that women are under-represented in the scientific and technical fields, and that the rate of attrition is greater for women than for men who enter training for such careers (Berryman, 1983; Wise, 1985). Tittle (1986) has reviewed the literature on gender research, and has concluded that there is a need to identify "modifiable psychological characteristics that tend to be differentially associated with each sex" (p. 1163). Tittle suggests researchers pay particular attention to interests, attitudes, values, and expectancies of students, particularly at the secondary and postsecondary levels.

In the area of educational performance, research has shown that there are sex differences in performance on tests of mathematical problem solving, general science, and computer skills. Gender differences have also been found in entry to math- and science-related careers. Researchers have generally attributed these differences to gender-related differences in educational encouragement, in previous experiences, and in expectations for success (Tittle, 1986).

Many researchers have found positive relationships between expectancy of success and actual academic achievement. Interested readers are referred to

the excellent review by Vollmer (1986). Additionally, it has often been found that females have lower expectations for competence in math and science and related courses, as well as fewer past experiences with them (Kahle, & Lakes, 1983). At this time, it is not known whether such phenomena also occur among architecture students.

The purpose of this study was to investigate expectancy and experience variables as they relate to gender and achievement among students enrolled in a first course in architecture. Specifically, the research was aimed at investigating gender differences in (a) semester project and final course grades, (b) previous experiences, and (c) expectancy as related to grades.

Knowledge about such variables should prove useful to architectural educators striving to achieve equity in recruiting, in teaching methods in introductory courses, and throughout training and eventual entry into the profession.

Method

Sample

Subjects were students at the University of Arizona's College of Architecture enrolled in a course in Fundamentals of Architecture. The course Architecture 118: Structure in Architecture is offered in both the fall and spring semester by the same professor. Approximately 120 students were enrolled each semester. This was the first structures course for all students. The course was primarily a lecture course that also required a semester project in which students worked in small groups on a structural design project.

Procedures

Two weeks before the end of the term, after the projects had been

completed and turned in, students were asked to fill out a questionnaire designed by the researchers. The questionnaire required students to mark the grade (A, B, C, D, F) they anticipated receiving for the project, to rate their previous architecture-related experiences (extensive, some, none), and to indicate gender.

Actual grades received on the projects as well as final course grades were reviewed with the professor of the course. Various chi-square tests were applied to the data to investigate gender differences.

Results

Table 1 displays some descriptive data obtained from the questionnaire.

Insert Table 1 About Here

A chi-square goodness-of-fit test was calculated on all project grades, using the frequencies from the self-predicted grades to generate expected frequencies. This yielded a significant chi-square of $(3, N = 194) = 255.48$, $p < .001$, showing that there is a difference between the distribution of project grades predicted by students and the distribution of actual, awarded project grades. Inspection of each term in the chi-square equation reveals that the greatest contributors to the chi-square of 255.48 were the B, C, and D and lower categories, which contributed 30.08, 44.52, and 180.50, respectively (D and F categories were combined into one category due to small frequencies). Fewer students received B's than expected, while more students received C's and D's than would be expected if self-predictions had been accurate. The A category contributed only .38 to the total chi-square of 255.48.

Past research dealing with science and mathematics has indicated that females do not view themselves as being as experienced as males in science and mathematics. To determine if female architecture students similarly view themselves as having less previous architecture experience than males, a 2 x 3 chi-square test of independence (self-reported experience level by sex) was performed on the data from the question asking students to rate previous architecture experience. This yielded a significant chi-square of 27.08 (2, N = 193) = 27.08, $p < .001$ indicating that self-perceptions of past architecture experience is not independent of sex. It is apparent that males view themselves as more experienced than do females.

If females do not have as much experience, or do not view themselves as experienced as males, it could be expected that females would expect lower grades than males. Table 2 presents a 4 x 2 (project grade expected by gender) chi-square test of independence on responses to the item in which subjects predicted their term project grades.

Insert Table 2 About Here

The chi-square (2, N = 194) of 10.34, $p < .02$ reveals that the distribution of predicted project grades is not independent of gender. Males predicted more B's and fewer C's than expected, while females demonstrated the opposite trend: they predicted fewer B's and more C's than expected (both sexes predicted the expected number of A's). In short, females predict lower grades than do males.

The differences found in male and female self-perceptions of previous architectural experience and in grade expectation leads inevitably to the question of relative performance of the sexes. Two additional chi-square

analyses were conducted: one a 4×2 (project grade by gender), and a 5×2 (final grade by gender). The significant chi-square (3, $N = 229$) of 10.40, $p = .05$ indicates a relationship between project grade received and gender. However, inspection of data in Table 1 reveals that contrary to past research expectations, females did not earn lower semester project grades than males. The distribution of final course grades indicated no significant relationship to sex with an X^2 (4, $N = 228$) = 4.86. Thus, while females were found to perceive themselves to have had less architecture-related experience than males, and to predict lower project grades than males, females did not perform below males in actual grades earned on the semester project and in final course grades.

Discussion

It appears that many beginning architecture students in these two sections did not have realistic expectations concerning the grading of their projects, with many students expecting higher grades than those actually awarded. It is important to note that this occurred even though the professor presented full written and oral explanations of grading criteria as well as graded examples of past semester projects. This might reflect the professional expectations of the professor in encouraging the students, or it might simply reflect poor student self-evaluation skills.

Inspection of the data revealed that the disparity between actual and expected grades occurred in the B, C, and D/F ranges. (There was no significant difference between number of A's expected and received.) This finding may reflect the well-documented phenomenon of grade inflation in American higher education (Cook, 1985; Millman, Slovacek, Kulick, & Mitchell, 1983).

Females in the current study predicted lower grades than did males, even though they performed on a par with males on both semester term project and final grades. Future research should test whether females who perceive themselves as having as much architecture-related experience as males would predict equally high grades with males. In the present study, since data was gathered anonymously, there was no way to compare predicted grades with actual grades on a case-by-case basis. In the future, it would be interesting to do so and to determine which group of predicted grades are the most and the least accurate. (The current data suggests that better students may predict more accurately than average or poorer students. Perhaps the average student is given less precise or accurate feedback concerning performance). This might lead to specific early intervention with certain groups of students based on their grade predictions. If students could be influenced to make more accurate predictions, they might then be led to take early steps to improve their grades.

Males in the current study perceived themselves to have more architecture-related experience than did females. These findings are similar to those found among mathematics and science students. That is, female architectural students believe themselves to have less architecture experience than do male students. This may have occurred for reasons similar to that found in the areas of mathematics and science: that is, female students may be influenced by teachers, counselors and others who hold stereotyped views of appropriate career roles for females and do not provide equal support and encouragement or equal experiences for females expressing interest in architecture. Future research should determine whether this is an accurate perception. Since there were no significant gender differences found in semester project and final course grades for architecture students, it may be

that conditions of the past that led to higher grades for males may now have changed. However, additional research is needed to confirm this hypothesis or to extend the findings to other disciplines.

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Table 1

Descriptive Data Obtained from Freshmen Architecture Students

	Gender		Total
	Male	Female	
Project Grades			
A	70	32	102
B	37	14	51
C	35	20	55
D	12	0	12
F	9	0	9
Total	163	66	229
Final Grades			
A	19	8	27
B	54	17	71
C	56	23	79
D	18	14	32
F	15	4	19
Total	162	66	228
Self-Predicted Grades			
A	58	23	81
B	71	21	92
C	8	11	19
D	2	0	2
Total	139	55	194
Perceived Experience			
Extensive	32	5	37
Some	83	20	103
None	23	30	53

Table 2
Contingency Table on Self-Predicted Semester Project Grades and
Gender

	Gender		N
	Males	Females	
Self-Predicted Project Grades			
A	58	23	81
B	71	21	92
C & D	10	11	21
Total	139	55	194

$\chi^2 = 10.33, p < .05$